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# A METHOD FOR ASSESSING BUILDING CODES FOR NATURAL HAZARD RESILIENCE

**Report for Resilience NSW**

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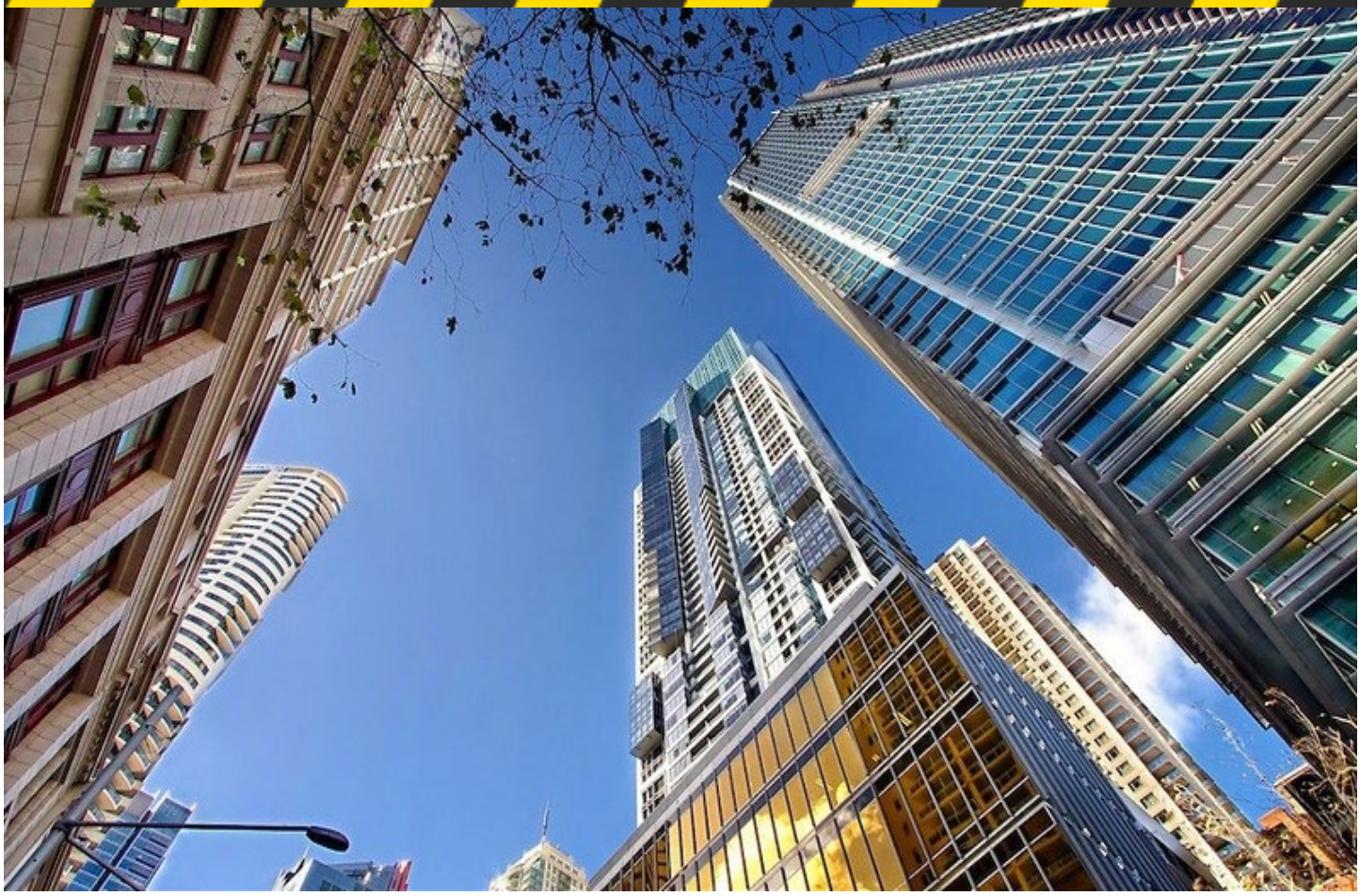

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# INTRODUCTION

Building codes regulate the design and materials of structures in the built environment, often in parallel with related processes such as land use planning. Building codes establish a standard of certainty that structures achieve pre-established levels of safety and health. In parallel, building codes are potentially able to contribute to natural hazard resilience, although ongoing improvements are needed to account for a variety of emerging challenges and insights from new research.

This summary outlines a generalised method to assess building codes, their application in New South Wales, and related mechanisms in terms of their contribution to natural hazard resilience, identifying areas for improvement and further research. It ensures that methods used and findings are reported in language and formats easily accessible by a wider audience of emergency management, land use planning and design practitioners.

# PURPOSE AND BENEFITS: EMERGENCY MANAGEMENT AND BUILT ENVIRONMENT SECTORS

The method provides a basis for assessing building codes in NSW in terms of various natural hazards. It sets out a consistent approach using risk assessment and treatment fundamentals applicable to a range of settings.

It is based upon assumptions, terms and language consistent with those used in the emergency management, risk assessment and resilience fields. It also provides clear explanations of building codes and their implications for natural hazard resilience, while drawing on international best practice. This approach will assist designers and other built environment professionals to understand the implications of their work for natural hazard resilience, in parallel with providing risk professionals with links into the implications of building codes.

A consistent but adaptable format for reporting findings will contribute to knowledge being developed systematically. This will guide improvements to building codes and related mechanisms. It will also allow for a wide range of risk and resilience stakeholders to find common starting points for integrated action.

The research method was adapted from the Bushfire and Natural Hazards Cooperative Research Centre project *Integrating urban planning with disaster risk reduction*. This summary can be read in parallel with the 2021 report *Heatwave and building codes in New South Wales: Issues and prospects* (March, Legacy, Warren-Myers & Nogueira de Moraes, 2021). The method used could be adapted and applied to any natural hazard, including bushfires, flood, storm, cyclone, heatwave, earthquake, coastal erosion, building fires, drought and tsunami. Multi-hazards, cascading events and other related hazards can also be addressed.

# WHAT IS PRODUCED?

The model assessment approach produces a range of outputs set out in a consistent format that follows standard headings as below.

- Establishing assumptions
- Summary of hazard and risk drivers
- Literature review of best practice and other relevant materials
- Summary of research methods used
- Specific findings including:
    - General building safety & tolerance – code deficits
    - Modelling exposure and vulnerability
    - Vulnerable persons needs
    - Integration of building code, urban design and urban planning mechanisms
    - Prevention and remediation via spatial management systems
    - Retrofitting and future-proofing options
    - Settlements – complementary inclusions
    - Interactions with other systems
    - Alignment with NSW ERM Framework, National Disaster Risk Reduction Framework, National strategy for Disaster Resilience & NSW State Emergency Plan (EMPLAN), and supporting Emergency Management Sub-Plans & EM Supporting Plans
    - Implications for response and recovery
- Key areas for attention
    - Policy action and change
    - Research and knowledge
    - Integration
    - Direct actions and demonstration examples.
    - Emergency management buildings & impacts to emergency service operations

# HOW IS IT PRODUCED?

The assessment method follows the iterative research steps:

1. Establish core assumptions and intentions
2. Describe the hazard, its key processes, outcomes and risk factors
3. Review literature according to core assumptions and intentions
4. Assess current approaches by comparision to best practice
5. Establish themes, actions and next steps

## ESTABLISH CORE ASSUMPTIONS

The main assumptions of the method include an understanding of resilience, approaches to risk treatment, and fundamentals of integration. Establishment of these steps allows for a comprehensive wider assessment that can form the basis for more detailed subsequent work. Any detailed assumptions specific to a study need to be established at this stage. These assumptions form the basis of subsequent enquiry and assessment.

Resilience in this method follows from the glossary of the Australian Institute of Disaster Resilience based on the definition of the UNDRR (then UNISDR), as:

> The ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions (UNISDR, 2015).

*Treatments of risk encompass fire core categories of action:*

1. avoidance of exposure/ separation from hazard
2. reduction of hazard
3. reduction of vulnerability to hazard
4. improvement of response
5. improvement of recovery.

It is acknowledged that building codes are one aspect of multiple wider processes influencing resilience. Accordingly, integration is fundamental to risk reduction and includes actions across a range of processes and systems, including the following.

1. The widest range of potential risk treatments are utilised and integrated, including Prevention, Preparedness, Response and Recovery phases.

2. The full spectrum of legacy, projected and emergent risks are spatially considered on the basis of up to date hazard mapping and integrated spatial assessment.

3. Goals, objectives and other relevant guiding principles and terminology are integrated across relevant systems.

4. Relevant legislative, regulatory, policy and planning provisions are integrated across systems.

5. Relevant local, cultural, social, economic and ecological matters are acknowledged and taken into account.

6. Relevant processes are integrated across systems.

7. Relevant stakeholders are represented in key processes and activities.

8. The full range of financial and investment mechanisms are integrated with other processes, activities and goals.

## DESCRIBE THE HAZARD, ITS KEY PROCESSES, OUTCOMES AND RISK FACTORS

Describe and document core understandings of the hazard, both locally and internationally using a range of trustworthy data and verifiable literature.

| ***Hazard based building code assessment*** | |
|---|---|
| Hazard | Describe and define the hazard |
| Site for assessment | What is geographical area of assessment?<br><br>What are the relevant characteristics of the structures in their setting? |
| Fundamental processes | Describe the processes and main characteristics of the hazard: temporal, physical, social other relevant factors |
| Mechanisms of interaction – structures | Because this assessment is oriented to building codes, describe the ways that the hazard interacts with structures. |
| Mechanisms of interaction – human and other values related to structures | Describe how the hazard interacts with humans and other elements in the community and environment |
| Impacts/consequences/risks | Describe the ways that risks result from the hazard's interactions with vulnerable elements in the community, how exposure occurs and the manner in which risks result. What are the main drivers of risk and how |

| | |
|---|---|
| | do these relate to known likelihoods and outcomes/consequences? |

## REVIEW BEST PRACTICE LITERATURE ACCORDING TO CORE ASSUMPTIONS

Gather and describe best practice knowledge about the hazard according to the core assumptions of the study. The table below shows a suggested overall framework that can be used as a starting point, oriented to core risk drivers and treatments. It may also be appropriate to theme approaches and understandings. Approaches to exposure, resistance/ vulnerability and hazard will be specific to the hazard being examined. For detailed descriptions of these terms see NERAG (2015).

| ***Best practice documentation and categorisation*** | | | | |
|---|---|---|---|---|
| | **Description** | **Risk aspect** | | |
| | | **Exposure** | **Resistance (vulnerability)** | **Hazard** |
| Systems of regulation | What approaches to regulation exist in different contexts? | | | |
| Processes of applying codes | Describe key processes. What and who applies the codes? What are the legislative and regulative bases? | | | |
| Emphasis on plan, respond recover? | What approaches are used across the PRR spectrum and do these include other innovative approaches that may not fall within current codes? | | | |
| Interactions with other systems | How do the codes interact with other systems and processes? | | | |

## ASSESS CURRENT APPROACHES BY COMPARISON TO BEST PRACTICE

Following from the documentation of best practice above, use the following table as a basis for assessing current approaches used by comparison. It may be useful to rate current practice or to highlight key areas for attention and improvement.

| ***Building controls compared with best practice – example traffic light for prioritisation*** | | | | | |
|---|---|---|---|---|---|
| | **Description** | **Risk aspect** | | | **Assessment (summary)** |
| | | **Exposure** | **Resistance (or vulnerability)** | **Hazard** | |
| Systems of regulation | | | | | |
| Processes of applying codes | | | | | |
| Emphasis on prevention, preparedness, response or recovery?, | | | | | |
| Interactions with other systems | | | | | |

## ESTABLISH THEMES, DOCUMENT FINDINGS AND NEXT STEPS

While the specific circumstances and audience will largely dictate the nature of the assessment's outputs, a range of considerations are listed below for consideration.

- Distribution to relevant stakeholders for feedback
- Integration changes needed
- Code and regulatory change needed
- Further research, data development and sharing
- Policy or organisational change
- Allocation of budgets and responsibilities
- Development of time horizons for change
- Undertaking of direct actions
- Development of demonstration projects.

# REFERENCES

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